

4.0 Watershed Management

The 1996 Safe Drinking Water Act Amendment promotes “source protection” as a key component in protecting drinking water quality. Source protection is the first step in a multi-phased approach to protecting water quality and is accomplished through a watershed protection plan. Subsequent phases include treatment, disinfection and distribution system controls.

4.1 Watershed Management Plan

The Pennichuck Water Works Watershed Management Plan was published in August 1998. The management plan is summarized below:

4.1.1 Watershed Characteristics

The Pennichuck watershed lies in five towns including Nashua, Merrimack, Amherst, Milford and Hollis. The watershed is divided into 10 subwatersheds as summarized in Table 4-1 and shown on Figure 4-1.

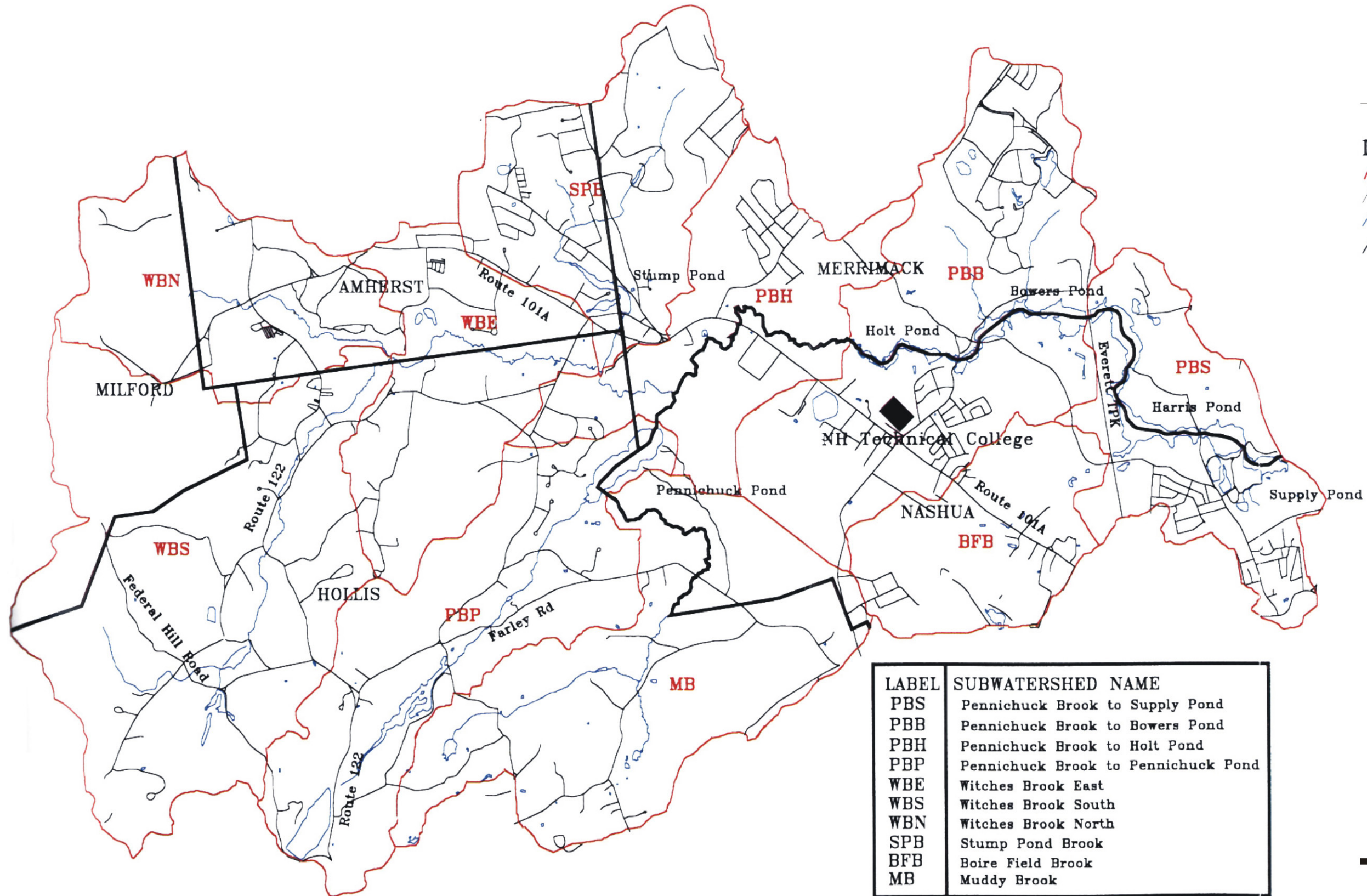
Table 4-1 Subwatershed Characteristics - Pennichuck Water Works Watershed

Subwatershed ¹	Land Area (acres)	Water Surface Area (acres)
PBS – Pennichuck Brook to Supply Pond	1285	140
PBB – Pennichuck Brook to Bowers Pond	2390	94
PBH – Pennichuck Brook to Holts’s Pond	1508	0
PBP – Pennichuck Brook to Pennichuck Pond	1978	89
WBE – Witches Brook East	1365	0
WBS – Witches Brook South	3193	0
WBN – Witches Brook North	1425	0
SPB – Stump Pond Brook	1516	21
BFB – Boire Field Brook	1006	0
MBI – Muddy Brook	2317	7
Total Acreage	17,984	351

¹ See Figure 4-1 for Subwatershed Locations

Source: Pennichuck Water Works Watershed Management Plan, August 1998

Legend
Watershed Boundary
Roads
Water
Town Lines



The watershed drains to a series of ponds including Stump Pond, Pennichuck Pond, Holts's Pond, Bowers Pond, Harris Pond and Supply Pond. Table 4-2 below summarizes pond characteristics. These larger ponds and a number of smaller ponds make up approximately 351 acres of surface water in the watershed.

Water is taken from Harris Pond 12 months of the year and supplemented with water from Supply Pond for 6 months of the year. In addition, water from the Merrimack River is taken into Bowers Pond primarily during the summer months when pond levels are lowest and water demand is highest.

Table 4-2 Pond Characteristics

Pond Name	Drainage Area (acres)	Pond Surface Area (acres)	Pond Storage (MG)
Stump Pond	1,516	21	Unknown
Pennichuck Pond	4,295	57	Unknown
Holtss Pond	14,171	23	Unknown
Bowers Pond	15,955	92	180 at full pond
Harris Pond	17,199	78 at spillover	340 at spillover
Supply Pond	17,598	16	Unknown

Source: Pennichuck Water Works Watershed Management Plan, August 1998

4.1.2 Water Quality of the Watershed

Water quality monitoring was done at various times between 1991 and 1996 for bacteria and nutrients as reported in the Pennichuck Water Works Watershed Management Plan. Samples were taken at 13 locations including at four dams and in nine tributaries. Following is a summary of the water quality data:

Fecal Coliform Samples were collected for fecal coliform analysis from 10 locations in various ponds and brooks from 1991 through 1994 and from 12 locations in 1996. Table 4-3 presents a summary of the data. A threshold concentration of 200 colonies per 100 ml was used to evaluate the sampling data. Approximately 7% of the samples collected from the ponds and 20% collected in the brooks exceeded the threshold limit.

Table 4-3 Summary of Fecal Coliform Data 1991-1996

Description	Ponds	Brooks
Number of Samples	449	409
Highest Concentrations, Colonies per 100 ml	540	4,600
Number of Samples Exceeding 200 colonies/100 ml	30	82
Percentage of Samples Exceeding 200 colonies/100 ml	7%	20%

Source: Pennichuck Water Works Watershed Management Plan, August 1998

Phosphorus Samples were collected for total phosphorus from 13 locations in various ponds and brooks during 1995 and 1996. A threshold value of 0.1 mg/l was used to evaluate the results from the sampling data. Table 4-4 presents a summary of the data. Approximately 28% of the samples collected from the ponds and 30% collected from the brooks exceeded the threshold limit.

Table 4-4 Summary of Total Phosphorus Data, 1995 and 1996

Description	Ponds	Brooks
Number of Samples	49	56
Highest Concentrations, mg/l	4.53	1.35
Number of Samples Exceeding 0.10 mg/l	14	17
Percentage of Samples Exceeding 0.10 mg/l	28%	30%

Source: Pennichuck Water Works Watershed Management Plan, August 1998

Nitrate-Nitrogen Samples were collected for nitrate nitrogen from 13 locations in various ponds and brooks during 1996. A threshold value of 10 mg/l was used to evaluate the results from the sampling data. Table 4-5 presents a summary of the data. None of the samples collected exceeded the threshold limit.

Table 4-5 Summary of Nitrate Nitrogen Data, 1996

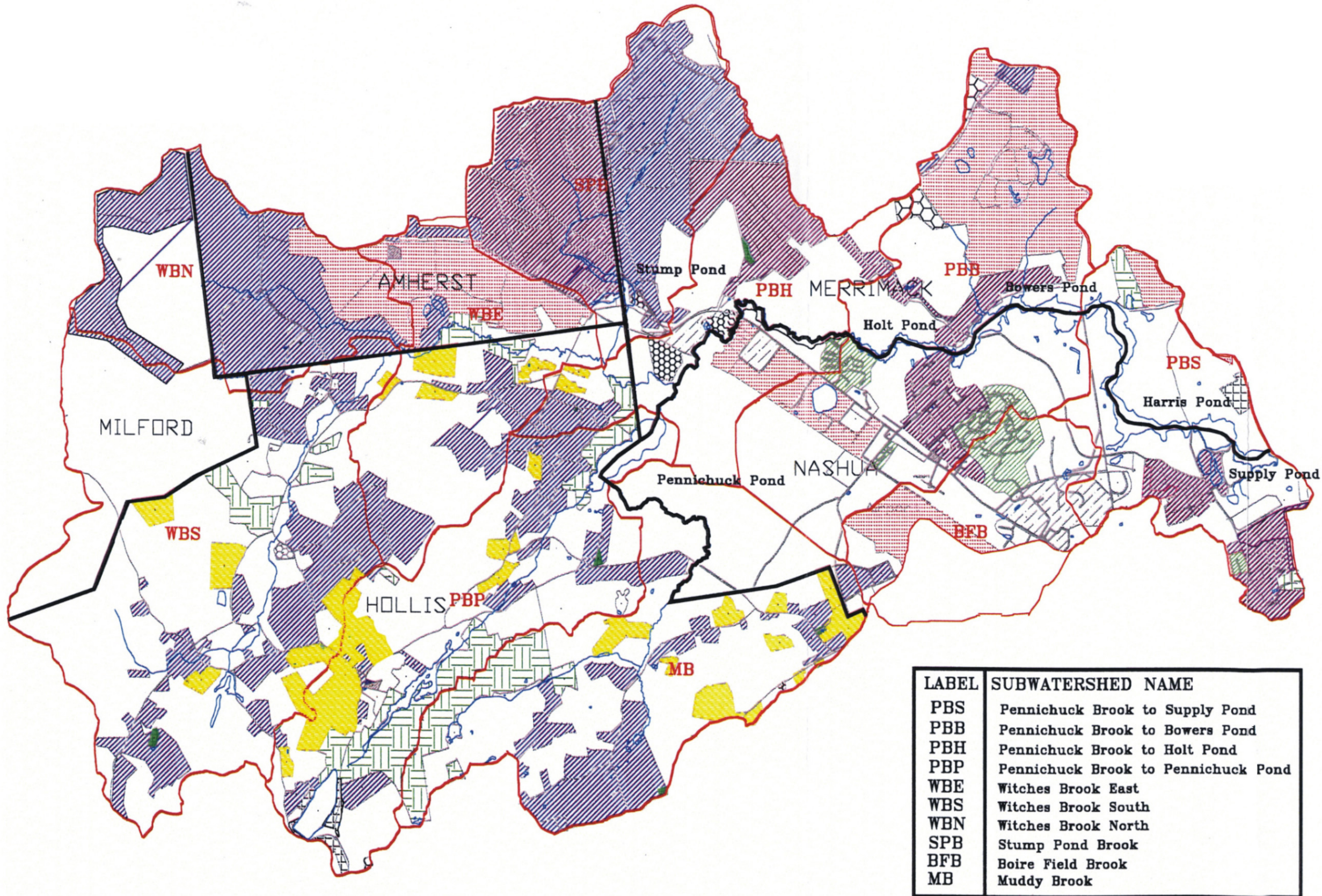
Description	Ponds	Brooks
Number of Samples	18	21
Highest Concentrations, mg/l	0.52	0.74
Number of Samples Exceeding 10 mg/l	0	0
Percentage of Samples Exceeding 10 mg/l	0%	0%

Source: Pennichuck Water Works Watershed Management Plan, August 1998

4.1.3 Pollution sources

A number of land use activities in the watershed were identified in the management plan as potential sources of pollution. Figure 4-2 shows various land use activities that are potential sources of pollution to the water supply. These include:

Residential, >1 acre lots	Residential, ½ to 1 acre lots
Residential, < ½ acre lots	Agriculture
Municipal/State Park	Multi-Family Dwellings/Condos
Town Owned Land	Vacant Undeveloped Land
Commercial	Industrial



LEGEND

- Watershed Boundary
- Roads
- Water

- Residential > 1 acre lots
- Residential 1/2 to 1 acre
- Residential < 1/2 acre lots
- Agriculture
- Municipal / State Park
- Multi-Family Dwellings/Condos
- Town Owned Land
- Vacant Unbuilt Land
- Commercial
- Industrial

LABEL	SUBWATERSHED NAME
PBS	Pennichuck Brook to Supply Pond
PBB	Pennichuck Brook to Bowers Pond
PBH	Pennichuck Brook to Holt Pond
PBP	Pennichuck Brook to Pennichuck Pond
WBE	Witches Brook East
WBS	Witches Brook South
WBN	Witches Brook North
SPB	Stump Pond Brook
BFB	Boire Field Brook
MB	Muddy Brook

Map based on data from NRPC.



3600 0 900 1800 3600

Approximate Scale

4.2 Model Watershed Management Plans

The 1996 Safe Drinking Water Act Amendments established a nationwide commitment to safe drinking water based on watershed management and pollution prevention. The Amendments required that each State establish a watershed management plan which include the following steps:

- | | |
|--------|---|
| Step 1 | Organize a community planning team |
| Step 2 | Delineate water supply watershed |
| Step 3 | Inventory existing sources of pollutants and prioritize threats |
| Step 4 | Prepare source protection plan |
| Step 5 | Implement the plan and educate the public |

After completing an inventory of the potential threats to the water supply, Best Management Practices (BMPs) can be implemented to prevent or control the threats. These BMPs can range from regulatory controls and public education to structural controls.

In order to assess the Pennichuck Watershed Management Plan it was compared to four other similar plans. These plans include:

- Lake Massabesic Watershed Management Plan – Manchester Water Works, New Hampshire
- Little River Watershed Protection Plan – Springfield Water and Sewer Commission, Massachusetts
- Wachusett Reservoir Watershed Protection Plan – Massachusetts District Commission and Massachusetts Water Resources Authority
- Model Watershed Management Plan – “Source Protection: A National Guidance Manual for Surface Water Supplies” by New England Interstate Water Pollution Control Commission

Table 4-6 on the following pages presents a summary of the comparative analysis of the Pennichuck Water Works Watershed Management Plan with that of the four plans listed above.

Table 4-6 **Comparison of Watershed Management Plans – Existing and Recommended Protection Measures**

Comparative Criteria	Lake Massabesic Watershed Management Plan Manchester Water Works. NH	Little River Watershed Protection Plan Springfield Water and Sewer Commission. MA	Wachusett Reservoir Watershed Protection Plan MDC and MWRA	Source Protection: A National Guidance Manual for Surface Water Supplies NEIPCC	Pennichuck Water Works Watershed Management Plan
Storm Water Management	<ul style="list-style-type: none">- Storm water ordinance prohibiting industrial zones within critical areas- Plan reviews for storm water drainage systems	<ul style="list-style-type: none">- Storm water runoff managed by the MADEP under the Massachusetts storm water policy- Commission owns spill control booms for deployment in the event of a spill into a reservoir or tributary of the water supply	<ul style="list-style-type: none">- Use of best management practices for stormwater runoff from new development- Limit impervious cover to 10 percent per lot in protection zones- Evaluate structural controls to reduce pollutant loads in storm water- Disconnect illegal floor drains- Fully implement existing authority under the NPDES permitting program to include storm water runoff- Ensuring proper handling of hazardous materials and wastes	<ul style="list-style-type: none">- Educate municipalities, industries and residents on pollution prevention measures such as waste oil and hazardous waste collection; reduced fertilizer, pesticide, and herbicide use; animal waste removal; catch basin maintenance; use; of oil and grit separators; construction activities that promote erosion and sedimentation control etc.- Evaluate the installation of BMPs such as vegetated buffer strips adjacent to waterbodies, grassy swales along roadways, detention basins, sedimentation basins, infiltration basins, wet ponds, constructed wetlands filtration of runoff through the use of installed filters, etc.	<ul style="list-style-type: none">- Require post-development runoff equal predevelopment runoff- Minimize parking lot impacts using permeable dividers, street buffer strips and modified landscaping- Reduce transportation impacts of subdivisions by using narrow streets with grass swales- Use onsite infiltration whenever possible, including recharge of roof leaders and other drainage structures- Use clearing and grading plans that minimize site disturbance- Require grading plans, erosion control plans and inspect progress during construction- Minimize lawn sizes, encourage the use of native species for landscaping wherever possible and leave native vegetation in place as a buffer
Pond Eutrophication		<ul style="list-style-type: none">- Monitoring suggests that runoff entering tributaries and reservoirs does not lead to a significant increase in bacterial or nutrient loading- Water quality of the reservoirs is monitored on a weekly basis			<ul style="list-style-type: none">- Determine sediment depths in each of the ponds and dredge as needed to provide sedimentation capacity
Buffer Zones/Land Acquisition	<ul style="list-style-type: none">- Purchase land surrounding the waters outright or obtain conservation easements	<ul style="list-style-type: none">- The Commission owns and protects 12,000 acres or 38% of the watershed area- Approximately 95% of the land surrounding the reservoirs and 10% of the land adjacent to the tributaries is under direct ownership of the Commission- Continue purchasing land and conservation restrictions	<ul style="list-style-type: none">- Buffer zone of 200 feet from tributaries and 400 feet from reservoirs- MDC owns 7,000 acres of protected open space land in the watershed, approximately 10% of the watershed- 7,500 acres or approximately 10% of open space is owned by state/municipal agencies in the watershed- Additional land acquisition of 10,500 acres will increase the MDC land ownership to 25 percent.- MDC owned stream bank and shoreline frontage would increase from 18.1 percent to 34.4 percent	<ul style="list-style-type: none">- Buffer zones have been recognized as highly effective in protecting critical areas around water supplies- Optimally, municipalities or water supply utilities should own or acquire buffer areas to protect water supplies- Purchasing or transferring development rights or outright purchase of land are other methods of protecting watershed land from development	<ul style="list-style-type: none">- Buffer zone of 200 feet around tributaries to the ponds and 400 feet around the chain ponds
Transportation Impacts	<ul style="list-style-type: none">- Revised sand to salt ratios- Alternates to using sodium chloride- Snow removed from roads should be dumped outside of critical areas- Educate salt truck operators on optimum application rates and efficiency- Proper storage of road salt	<ul style="list-style-type: none">- The Massachusetts Turnpike Authority has posted watershed limits and monitors traffic	<ul style="list-style-type: none">- Reroute transport of hazardous waste and materials to less dangerous roads away from the reservoir- Evaluate structural controls for railroads- Develop interagency emergency response plan and training- Train local and MDC police to enforce regulations regarding transport of hazardous materials- Develop agreements with transporters to have them submit annual summary reports describing transportation activities- Encourage low salt use on roads- Monitor outdoor storage supplies of salt	<ul style="list-style-type: none">- Catch basin cleaning- Controlled application of approved dust suppressant materials- Vegetated filter strips to reduce velocity and increase infiltration of road runoff- Proper road ditch management- Street sweeping/road cleanup- Proper management of road salt storage facilities- Road salt application management	<ul style="list-style-type: none">- Work with Public Works Departments and the state Department of Transportation to avoid direct piping of runoff to streams- Use infiltration technologies such as grassed swales and leaching catch basins- Work with watershed Fire Departments to address spill issues- Develop a monitored demonstration roadway for comparison to an old style roadway

Comparative Criteria	Lake Massabesic Watershed Management Plan Manchester Water Works. NH	Little River Watershed Protection Plan Springfield Water and Sewer Commission. MA	Wachusett Reservoir Watershed Protection Plan MDC and MWRA	Source Protection: A National Guidance Manual for Surface Water Supplies NEIPCC	Pennichuck Water Works Watershed Management Plan
Agricultural Impacts	<ul style="list-style-type: none">- Only federal or state approved fertilizers and pesticides permitted in the watershed- No fertilizer, except lime or wood ash, shall be used on lawns or areas with grass on residential properties		<ul style="list-style-type: none">- Develop a model best management practice policy for use in local agricultural operations- Enforce existing MDC regulations to prevent pollution from animal wastes- Evaluate and implement alternatives for eliminating water quality impacts of gull/geese roosting at the reservoir- Evaluate impact of increased bacterial levels in the system- Support concept of new Massachusetts Department of Food and Agriculture regulations protecting ground water supplies from the use of herbicides and pesticides- Encourage the use of integrated pest management (IPM) program	<ul style="list-style-type: none">- Erosion and sedimentation control measures such as conservation tillage, vegetated filter strips, cover crops, pasture management, and reduced irrigation- Fertilizer management that includes calibration of application equipment, crop rotation, etc.- Pesticide management that includes calibration of application equipment, possible substitute with a less toxic alternative, etc.- Animal waste management that include impermeable floors for manure storage sheds, use of vegetative filter strips around animal facilities as a means of treating contaminated runoff	<ul style="list-style-type: none">- Provide education materials for agricultural landowners- Request buffer strips or zones from livestock concentrations- Purchase conservation easements where needed to protect from direct stream channel encroachment by livestock
Recreational Activities	<ul style="list-style-type: none">- Hiking, biking and fishing are allowed. However, kiosks setup at the recreation sites educate the public about protection of water	<ul style="list-style-type: none">- Limited public and private recreation in the watershed- “No Trespassing” rule on the watershed land	<ul style="list-style-type: none">- Develop and implement a recreational management plan that includes a permit system and restricted access	<ul style="list-style-type: none">- Prohibit any use and access to finished water reservoirs and adjacent lands- Use limits on allowable contact with the feeding tributaries- Establishing prohibition zones where public access is not allowed- Educate public about the objectives of watershed protection program, policies, regulations and enforcement to control activities that may threaten water quality	
Individual Septic Systems	<ul style="list-style-type: none">- Watershed patrol’s duties focus on performing sanitary survey of the watershed including walking lot to lot and looking for any visual evidence or smell indicating a septic leak	<ul style="list-style-type: none">- Information on the septic systems along the tributaries and to the reservoirs will be reviewed	<ul style="list-style-type: none">- Repair or replace failing systems in critical areas throughout the watershed- Conduct and implement a facilities plan to provide long-term sewage disposal solutions- Ensure strict enforcement of Title V and local requirements- Develop and implement stronger Board of Health regulations (Model regulations)- Limit density of development through legislation or zoning- Develop a subsurface sewage disposal “Maintenance and Proper Use Program”	<ul style="list-style-type: none">- Septic system maintenance ordinance to ensure that septic systems are inspected and pumped periodically to prevent malfunction- Septic system tracking program that requires registration of all systems and encourages routine inspections and pumping- Municipal septic system program- Homeowner education concerning the proper care of a septic system- Guidelines for installing new septic systems	
Public Education	<ul style="list-style-type: none">- Kiosks setup at the recreation sites educate the public about ecology and lake use- Educational material on BMPs for lawn maintenance and gardening for home owners- Participate in national drinking water week to educate residents through public information displays, science fair, grade school poster contests and open tours of the WTP- Education by watershed patrolmen through personal contact	<ul style="list-style-type: none">- Tours of the facilities especially for school children- Annual open house at the water treatment plant	<ul style="list-style-type: none">- Promoting wise land use and development	<ul style="list-style-type: none">- Community wide water knowledge surveys assessing homeowner watershed knowledge, attitudes, and practices- Signs along roadways and in residential areas to identify watershed- Distribute BMP guidelines for items such as urban runoff, protecting critical areas, household hazardous materials, lawn-care and gardening, septic tanks and water conservation- Provide speakers for community groups to discuss topics such as septic system maintenance- Distribute newsletters or water bill inserts- Contact local school districts for participation in watershed protection activities- Set up a volunteer watershed monitoring program- Celebrations such as drinking water week or day and other watershed festivals	<ul style="list-style-type: none">- Hold a technical transfer workshop for Conservation Commissions, Planning Board members, Public Works staff, site developers and engineers- Develop an educational questionnaire to gauge the level of understanding within the watershed communities both before and after the education program- Develop a school age public education program for watershed schools

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Watershed Protection	<ul style="list-style-type: none">- Watershed patrols- Prohibition of swimming and wading- Prohibition of waste disposal within 200 feet of the lake	<ul style="list-style-type: none">- Program of logged inspections through regular tours by Watershed Team members for unauthorized activities, illegal dumping, encroachment, obstructions to stream flow, deteriorated and missing signs- A resident manager residing near the reservoir for security purposes- Evaluate a need for increases of manpower and vehicles for security to deter actions that might endanger the water supply- Help from State’s Environmental Police Officers to perform random patrols- “No Trespassing” and “Drinking Water Supply” place cards	<ul style="list-style-type: none">- Increase enforcement of existing local and state regulations regarding recreation, trash disposal, trespassing, and other activities incompatible with the watershed management- Train the Metropolitan and State Police staffs to address environmental crimes- Evaluate the feasibility of barriers to deter access- Managing forests and wildlife- Cleaning up contaminated sites	<ul style="list-style-type: none">- Policies, regulations and enforcement to control activities in the watershed that may threaten water quality	
Regulatory Authority	<ul style="list-style-type: none">- New Hampshire Code of Administrative Rules by NHDES “Rules for the protection of the purity of the water and ice of Lake Massabesic or any pond, reservoir or stream tributary thereto”	<ul style="list-style-type: none">- Zoning by-law with minimum lot sizes, frontage and set-backs and watershed protection districts- Commission By-Laws (Protection of the Water System)<ol style="list-style-type: none">1. Section 3.800 Protection of Property2. Section 3.810 Protection from Damage3. Section 3.820 Violation Penalty- Article 97 – Constitution of the Commonwealth of Massachusetts	<ul style="list-style-type: none">- Regulations regarding activity within the watershed system titled “Sanitary Protection of Waters Used by the Metropolitan District Commission for the Water Supply of any Town or Water Company Under the Authority of M.G.L. c. 92, Section 108” (310 CMR 23.00 et seq.)- Establishment of Use Districts, Intensities and Zoning Maps under the Massachusetts Zoning Act (M.G.L. c.40A)- Protection overlay districts- Wetland protection district to supplement Commonwealth’s Wetlands Protection Act, M.G.L. c.131, Section 40- Floodplain protection district	<ul style="list-style-type: none">- Zoning ordinances to control type of development- Designated vegetated buffer zones- water supply overlay protection zones- Performance-based or impact zoning- Local by-laws and ordinances to regulate existing land uses and establish specific requirements for control of pollutants- Conservation easements- Purchase of development rights- Transfer of development rights- Moratorium on development to allow for more comprehensive planning	<ul style="list-style-type: none">- Conservation zoning- Subdivision regulations- Site plan review- Protection overlay districts- The NH Code of Administrative Rules, Env-Ws 1008.03 septic systems establishes minimum set backs for septic tanks- Modify watershed regulations or develop cooperative agreements with watershed towns

4.2.1 Watershed Plan Implementation

Table 4-7 presents a comparison of the recommendations that have been implemented by Pennichuck Water Works and by the Massachusetts District Commission and Massachusetts Water Resources Authority relative to their respective Watershed Management Plans.

Table 4-7 Implementation of Watershed Management Plan

Protection Element	Wachusett Reservoir Watershed Protection Plan - MDC and MWRA	Pennichuck Water Works Watershed Management Plan
Storm Water Management	Division of Watershed Management has installed or implemented several BMPs to control stormwater including infiltration basin and sediment forebays An annual Wachusett Stormwater Project List is being developed that will include monitoring and modeling results and prioritizing the projects with an implementation schedule Additional elements of the approach to stormwater includes encouragement of town-wide Stormwater Plans	Study of Urban Non-Point Source Pollution, Pennichuck Brook to Bowers Pond Subwatershed was completed in Spring 2001. Studies for the Witches Brook East and North Subwatersheds were completed in Summer 2002
Buffer Zones/ Land Acquisition	The sum of MDC owned and other protected lands totals over 51% of the Wachusett Reservoir watershed lands and about 63% of the total watershed MDC nearly owns 100% of the lands within 400 feet of the reservoirs and 200 feet from the tributaries Allocated \$8 million per year between 1998 and 2002 for land purchase	Small quantities of land were acquired by outright purchase or easement
Transportation Impacts	In 1998 the Transportation Release Controls Study was completed that evaluated the risks of runoff and accidental spills from roads and railways and included recommendations to reduce existing risks The Hazardous Materials Emergency Response Study was completed that evaluated and made recommendations for improvements in the Emergency Response Plans of individual watershed communities	Designed and constructed the Pennichuck Brook Urban Runoff Project that captures and provides treatment for 1/3 of the storm water from 70 acre area along Rt. 101 A in Nashua
Pond Eutrophication & Agricultural Impacts	Division of Watershed Management is implementing agricultural BMPs at the high priority sites in the watershed in cooperation with the Department of Food and Agriculture	A study was completed to determine sediment depths in Pennichuck Ponds
Individual Septic Systems	Ensure strict enforcement of Title V and local requirements	
Public Education	MDC's Division of Watershed Management Rangers conducted 88 educational/interpretive programs in the watersheds with an estimated 4,360 participants since 1996	
Watershed Protection	Within 400 feet from the reservoirs and 200 feet from the tributaries no alterations are permitted Between 200 and 400 feet of the tributaries specific activities are prohibited and all development is scrutinized	Developed regular inspection of problem areas along Pennichuck Brook and identified areas of concern to the property owners with recommended remedies
Regulatory Authority	Watershed Protection Act was passed in 1992 and has been fully implemented since 1995 Maximized watershed protection by State and Local Regulations such as Title 5, Wetlands Protection Act and Storm water Policy	

4.2.2 Recommendations

Based on the information summarizes in Tables 4-6 and 4-7 the primary focus should be to implement the Pennichuck Water Works Watershed Management Plan. **The recommendations provided in the Watershed Management Plan coincide with those presented in the other model plans and industry standards, yet many of the recommendations have not been implemented. Once implemented, the Pennichuck Water Works Watershed Management Plan should be modified to expand in the following areas:**

- ***Storm Water Management*** Implement structural and educational measures and establish criteria that achieve qualitative limits of storm water discharging into the receiving waters; increase groundwater recharge; and increase storm water pretreatment
- ***Pond Eutrophication*** Implement educational measures and work with the Towns to develop and implement a model ordinance on fertilizer application
- ***Buffer Zones/Land Acquisition*** Develop capital plans that include land acquisition for conservation and providing buffer zones, acquiring conservation and developmental rights
- ***Transportation Impacts*** Develop a deicing policy and work with the State and Towns to implement the policy and include consideration of alternatives to sodium chloride
- ***Recreational Activities*** Develop and implement a recreational management plan that includes a permit system, restricts access and activities in critical areas of the watershed and employs an on-site watershed manager
- ***Individual Septic Systems*** Conduct sanitary surveys and develop remediation plans
- ***Watershed Protection*** Develop emergency response procedures, purchase necessary emergency response equipment and train police, fire, public health and hazardous material personnel; upgrade drainage structures to capture pollutants and spills prior to discharging to the receiving waters
- ***System Security*** Conduct a vulnerability analysis of the water supply, treatment and distribution systems

Table 4-8 summarizes the water quality benefits associated with implementation of the recommended measures stated above.

Table 4-8 Recommended Measures – Water Quality Benefits

Recommended Measure	Bacteria	Sodium	Nutrients	Solids	Toxics
Storm Water Management	X		X	X	
Pond Eutrophication			X		
Buffer Zones/Land Acquisition	X	X	X	X	X
Transportation Impacts		X		X	X
Recreational Activities	X		X	X	
Individual Septic Systems	X		X		
Watershed Protection					X
System Security					X

Implementation of the recommended measures presented above can be better performed by a publicly owned utility, which has greater regulatory authority and control over such items as land acquisition, recreational activities, individual septic systems, watershed protection and system security.

Table 4-9 Preliminary Costs - Recommended Measures Implementation

Recommended Measures	Initial Cost or Annual Cost	Total Cost Over 5 Years
Storm Water Management		
• Storm Water Brochure	\$50,000	\$50,000
• Structural Measures	\$100,000	\$300,000
Pond Eutrophication		
• Model Ordinance	\$200,000	\$200,000
Buffer Zones/Land Acquisition		
• Purchase land	\$100,000	\$500,000
Transportation Impacts		
• Develop Deicing Policy	\$50,000	\$50,000
• Alternatives to sodium chloride	\$50,000	\$250,000
Recreational Activities		
• Develop Recreational Management Plan	\$50,000	\$50,000
• Employ Watershed Manage	\$50,000	\$250,000
Individual Septic Systems		
• Conduct Sanitary Surveys	\$25,000	\$125,000
• Remediation of failing systems	\$50,000	\$250,000
Watershed Protection		
• Train police, fire, hazardous material personnel	\$20,000	\$100,000
• Purchase of emergency response equipment	\$50,000	\$100,000
System Security		
• Vulnerability Analysis	\$100,000	\$100,000
Total		\$ 2,325,000 say \$ 2,400,000